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ABSTRACT

The primary purpose of this research is to determine if there exists covert confounding in student perceptionnaires which significantly affect instructors ratings. Eight calculus classes were randomly selected. Each student completed a Texas A & M University (TAMU) student perceptionnaire the first day of class, envisioning having completed the course with it meeting the highest ideals of expectation. Using the same form, each student evaluated his instructor at the end of the semester. Significant differences (.01 level), between class means existed in the students' ideal perception, as well as in the students' evaluative perceptionnaire. The results indicate that research using student perceptionnaires as an independent variable should provide for preconceived expectations of students. The perceptionnaire is included in the appendix. (Author/DEP)

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ED117180

Title: Covert Confounding in Student Evaluation of Instructional Ability

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Abstract

The primary purpose of this research is to determine if there exists covert confounding in student perceptionnaires which significantly affect instructors ratings. Eight calculus classes were randomly selected. Each completed a TAMU student perceptionnaire the first day of class, envisioning having completed the course with it meeting their highest ideals of expectation. Using the same form, each evaluated his instructor at the end of the semester. Significant differences (.01 level) between class means existed in the students ideal perception, as well as in the students evaluative perceptionnaire. The results indicate that research using student perceptionnaires as an independent variable should provide for preconceived expectations of students.

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TM005 036

Covert Confounding in Student Evaluation

of Instructional Ability

Objective of the Inquiry

In recent years, students have been called upon to evaluate their instructors teaching ability. In general, student questionnaires are designed to measure the student's perception of such factors as instructional ability, classroom environment, and student-teacher interest. The reliability of such instruments is questionable. Different subject matter fields, different classes of students, class times, etc., all affect the results of such questionnaires. Thus, the primary purpose of this research is to determine if there exists covert confounding in student perceptionnaires which significantly affect an instructor's rating.

Method and Instrument

A fundamental assumption of perceptionnaires is that the students comprising each subsample have the same preconceived expectations of a course, text, teacher, class time, etc. In order to test this assumption, eight classes of Calculus 230 (introductory course for majors other than mathematics or engineering) were randomly selected from 21 classes at a state supported university. On the first day of class, the students of each instructor completed a student perceptionnaire (Christensen and Bourgeois, 1974) with the following instructions enclosed:

> Envision having already completed Math 230 in this classroom and with these classmates. Suppose that the book, class conduction, and instructor; met your highest ideals of expectation.
>
> With this in mind, rate your ideal class. Be selective and react to each statement by the contribution it would have to your ideal Math 230 course. Don't mark extremes, unless you feel that the statement would truly indicate a significant contribution to an ideal class.

Again, the students of each instructor completed the perceptionnaire the last week of the semester, but reacting to the questions with regard to their instructor.

The perceptionnaire used, was devised by Christensen and Halter (1972) with factor analysis techniques. The perceptionnaire consisted of 35 questions (see Appendix A) from which means were calculated for the following seven factors: general teaching, outside assignments, student interest, text, classroom facilities, exams, and classroom discussion. The response to each question was on a scale of one (strongly agree) to seven (strongly disagree). Nineteen of the questions were stated negatively. A summary of the questions classified to fall in each factor is given in Appendix A.

Sample

The study was limited to 243 undergraduate students who registered for and completed Mathematics 230 in the Spring of 1974. These students had been pseudo-randomly assigned by the IBM 360 computer at Texas A&M University to eight sections taught by mathematics graduate teaching assistants (MGTA's). The eight sections were randomly selected from 21 sections of Mathematics 230. The mean number of students in each section was 30.4 with $S_{\bar{x}} = 4.107$. Over 71% of the students were male. The mean age was between 18 and 19 years; 38.9% were 18 years or less, 40.1% were 19 years, 17.2% were 20 years, and 3.9% were 21 years. The majority of the students were freshmen (63.5%), while only 30.2% were sophomores, and the remaining 6.3% were juniors. The ten majors which accounted for 81% of the 243 students were as follows: pre-medical (20.9%), biology (12.5%), accounting (9.8%),

pre-veterinary (9.8%), finance (7.4%), management (5.1%), environmental design (5.1%), pre-dental (4.4%), psychology (3.0%), and wildlife and fisheries (3.0%). The remaining 19% of the students were distributed among 15 other majors. Duncan's Multiple Range Test (Table 1) indicates there was no significant difference ($p > .05$) in the mean CEEB english achievement scores in the eight sections ($S_{\bar{x}} = 16.861$).

Table 1

Duncan's Multiple Range Test Applied to the Mean CEEB English Achievement Scores in the Eight Sections

Section	2	3	1	7	4	6	5	8
CEEB English Mean Score	481.48	507.69	508.11	510.71	515.56	520.57	524.06	531.43

However, Table 2 indicates there was a significant difference ($p < .05$) in the mean CEEB mathematics achievement scores ($S_{\bar{x}} = 15.000$).

Table 2

Duncan's Multiple Range Test Applied to the Mean CEEB Mathematics Achievement Scores in the Eight Sections

Section	2	5	1	6	3	7	4	8
CEEB Mathematics Mean Score	532.94	544.93	549.70	554.00	561.54	573.93	574.47	581.41

Any two means not underscored by the same line are significantly different ($p < .05$). Any two means underscored by the same line are not significantly different ($p > .05$). Thus, in Table 2, section 8 scored significantly higher ($p < .05$) on the CEEB mathematics achievement test than did section 2. Refering to Table 1, section 2 also ranked lowest on the CEEB english achievement test and section 8 ranked highest. The total CEEB achievement score of section 2 was 1014.42, while that of section 8 was 1112.84. There was no significant difference ($p > .05$) in the vocabulary ($\bar{x} = 44.58\%$) or comprehension scores ($\bar{x} = 47.78\%$) on the Nelson-Denny reading test among the eight sections.

Results

Significant differences ($p < .01$) existed among the eight sections of Mathematics 230 with regard to the students' perception of an ideal teacher. This surprising result occurred on the following four factors: general teaching, outside assignments, examinations, and classroom discussion.

Duncan's Multiple Range Test for Means (Steel and Torrie, 1960) was applied to the ranked means of the general teaching factor for the ideal teacher and actual instructor. The results (Table 3) indicate that the perception of an ideal teacher by students in section 7 differed significantly ($p < .01$) from that of students in section 1 and 3. At the end of the semester, the mean perception of the general teaching ability of MGTA 7, MGTA 8, MGTA 6, and MGTA 5 was significantly ($p < .01$) less than the other MGTA's. The only MGTA's whose general teaching means exceeded their students' perception of an ideal teacher were MGTA's 1 and 2. The ranking of the differences between actual and ideal general teaching factor means

Table 3

Duncan's Multiple Range Test Applied to the General Teaching Factor* For the Ideal Teacher

Section	7	5	2	4	8	6	3	1
Mean of Ideal Perception ($S_{\bar{x}}$ = .2104)	4.94	5.50	5.52	5.71	5.73	5.73	5.85	6.09

Duncan's Multiple Range Test Applied to the General Teaching Factor* For the Actual Instructor

MGTA	7	8	6	5	4	3	2	1
Mean of Actual Perception ($S_{\bar{x}}$ = .2639)	4.09	4.81	5.00	5.01	5.20	5.46	5.83	6.10

Rank of Differences between Actual and Ideal General Teaching Factor Means by Section

Section	8	7	6	4	5	3	1	2
Actual less Ideal mean	-.92	-.85	-.73	-.51	-.49	-.39	+.01	+.31

*Any two means not underscored by the same line are significantly different ($p < .01$). Any two means underscored by the same line are not significantly different ($p > .01$).

by section (bottom of Table 3) is an alternative for measuring how well each instructor met his class' ideal perception of general teaching ability. However, multiple range tests are no longer applicable.

The data in Table 4 summarizes the importance that the students of the eight sections perceived an ideal teacher should place upon outside assignments ($S_{\bar{x}}$ = .2311). Any two means not underscored by the same line are significantly different ($p < .01$). Any two means underscored by the same line are not significantly different ($p > .01$). Thus, the students in sections 2 and 7 perceived outside assignments to be less important ($p < .01$) than the students in section 1. There were no significant differences ($p > .05$) in the actual outside assignments mean ($\bar{x} = 4.63$) for the eight MGTA's.

Table 4

Duncan's Multiple Range Test Applied to the Ideal Outside Assignment Factor

Section	2	7	5	6	8	4	3	1
Mean of Ideal Perception	4.32	4.39	5.03	5.06	5.08	5.22	5.26	5.73

Curiously, there were no significant differences ($p > .05$) in the ideal student interest mean ($\bar{x} = 4.46$) or the actual student interest mean ($\bar{x} = 4.00$) for the eight MGTA's. Apparently, the items forming the student interest factor should be reexamined. There were no significant differences

($p > .05$) in the perception of an ideal textbook ($\bar{x} = 4.86$) by the eight sections. However, at the end of the semester, the perceived value of the textbook to the course by sections 1, 3, 5, and 7 was significantly ($p < .05$) less than the other four sections. Oddly enough, sections 2 and 6 perceived their ideal classroom facilities of significantly ($p < .05$) less importance than did sections 3 and 4. At the end of the semester, sections 3, 5 and 7 perceived their classroom facilities to be less adequate than did section 4.

Duncan's Multiple Range Test (Table 5) was applied to the ranked means of the examination factor for the ideal teacher and the MGTA's. The results indicate that the perception of an ideal examination by students in section 7 differed significantly ($p < .01$) from that of students in section 1. At the end of the semester, the mean perception of the examinations of MGTA 7 and MGTA 4 was significantly ($p < .01$) less than that for MGTA 1 and MGTA 2. It is of interest to note that MGTA's 2, 6, 3, and 8 examination factor means exceeded their students' perception of an ideal examination. A second alternative for measuring the examination factor is given at the bottom of Table 5. Clearly, the ranks of the actual instructors is not altered by ranking the differences between the actual means by section and the overall ideal mean ($\bar{x} = 5.33$) for the examination factor. However, this procedure does give an indication of the relative centrality of the actual means and the ideal overall mean.

Table 5

Duncan's Multiple Range Test Applied to the Examination Factor* For the Ideal Teacher

Section	7	5	6	8	3	2	4	1
Mean of Ideal Perception ($S_{\bar{x}}$ = .2613)	4.68	5.25	5.26	5.27	5.32	5.45	5.52	5.96

Duncan's Multiple Range Test Applied to the Examination Factor* For the Actual Instructor

MGTA	7	4	5	8	3	6	1	2
Mean of Actual Perception ($S_{\bar{x}}$ = .2520)	4.23	4.81	4.91	5.41	5.47	5.65	5.89	5.97

Rank of Differences between Actual Means by Section and Overall Ideal Mean for the Examination Factor

Section	7	4	5	8	3	6	1	2
Actual less overall Ideal mean ($\bar{X}$ = 5.33)	-1.10	-.52	-.42	+.08	+.14	+.32	+.56	+.64

*Any two means not underscored by the same line are significantly different ($p < .01$). Any two means underscored by the same line are not significantly different ($p > .01$).

The data in Table 6 summarizes the results of Duncan's Multiple Range Test applied to the ranked means of the classroom discussion factor for the ideal teacher and the MGTA's. The students in section 7 perceived ideal classroom discussion to be significantly ($p < .01$) less important than did the students in all of the other sections. At the end of the semester, the perception of classroom discussion for MGTA's 7 and 8 was significantly ($p < .01$) less than that for MGTA 1 and MGTA 2. Only MGTA 2 exceeded his students ideal classroom discussion mean. A third alternative for measuring the classroom discussion factor is given at the bottom of Table 6. Ranking the differences between the ideal means by section and the overall actual mean ($\bar{x} = 5.00$) for the classroom discussion factor indicates the relative centrality of the ideal means and the overall actual mean.

Conclusions and Recommendations

Clearly, students preconceived expectations of an ideal student-teacher-learning situation have a profound effect upon the ratings of instructors. The three alternative rankings given in Tables 4, 5, and 6 demonstrate the impact of considering students preconceived expectations upon an instructors rating. Moreover, the significant difference ($p < .01$) between classes with regard to an ideal perception of general teaching, outside assignments, examinations, and classroom discussion; challenges the fundamental assumption that randomization alone will assure an unbiased estimate of a students perception of instructional ability. If no attempt is made to diminish the impact of these preconceived notions upon such commonplace rating instruments, then covert confounding inherently reduces the instrument's reliability.

Table 6

Duncan's Multiple Range Test Applied to
Classroom Discussion Factor*
For the Ideal Teacher

Section	7	2	5	4	8	6	3	1
Mean of Ideal Perception ($S_{\bar{x}}$ = .2008)	4.84	5.27	5.64	5.70	5.78	5.83	5.86	6.08

Duncan's Multiple Range Test Applied to the
Classroom Discussion Factor*
For the Actual Instructor

MGTA	7	8	5	6	4	3	2	1
Mean of Actual Perception ($S_{\bar{x}}$ = .2719)	4.03	4.48	4.72	4.85	4.99	5.37	5.61	5.71

Rank of Differences between Ideal Means by Section
and Overall Actual Mean for the Classroom Discussion Factor

Section	7	2	5	4	8	6	3	1
Actual Overall Mean ($\bar{x}$ = 5.00) less Ideal Means by Section	-.16	+.27	+.64	+.70	+.78	+.83	+.86	+1.08

*Any two means not underscored by the same line are significantly different ($p < .01$). Any two means underscored by the same line are not significantly different ($p > .01$).

Thus, it is recommended that all future research using student perceptionnaires as an independent variable, should consider the impact of preconceived expectations of the students upon instructor ratings. A procedure similar to the one employed in this paper should be used to determine students "ideal" perceptions. With such raw data at hand, future research on concomitant variables which would predict ideal expectations would aid in constructing a procedure to deal with student preconceptions. With appropriate measures of expectation provided for, a more powerful statistic could then be constructed. There are at least three obstacles to overcome in the construction of such a statistical procedure. First, an unbiased procedure to identify the "ideal" response and the "actual" response for each individual respondent is mandatory. A second obstacle is to determine a combination of the ideal and actual responses which are statistically meaningful. That is, a linear combination of an "ideal" and "actual" response to an evaluative question may not be of an appropriate probability distribution function for statistical testing. This is the third obstacle to overcome; the type of statistical test should be developed to conform to the distribution and the hypotheses in question.

In summary, the results of this study indicate that research using student perceptionnaires as an independent variable should provide for preconceived expectations of students. Future research on concomitant variables which would predict ideal expectation is necessary. Thus, in light of the present state of evaluating the educational process it is recommended that student perceptionnaires not be the sole basis for administrative decisions.

Selected References

CHRISTENSEN, L.B., & HALTER, G.M. Student questionnaire. Unpublished perceptionnaire funded by the College of Liberal Arts, Texas A&M University, 1972.

CHRISTENSEN, L.B., & BOURGEOIS, A.E. Student ratings of instructional effectiveness. Paper presented at the annual meeting of the American Psychological Association, New Orleans, Louisiana, 1974.

STEEL, R.G., & TORRIE, J.H. Principles and Procedures of Statistics. New York: McGraw-Hill, 1960.

APPENDIX A[1]

PERCEPTIONNAIRE

[1]CHRISTENSEN, L.B., & HALTER, G.M. Student questionnaire. Unpublished perceptionnaire funded by the College of Liberal Arts, Texas A&M University, 1972.

Summary of Questions Identified

as Factors

FACTOR I General teaching ability includes the following question numbers: 1, 2, 3, 9, 10, 11, 13, 14, 17, 18, 20, 22, 23, 24, 26, and 29.

FACTOR II Outside assignments includes the following question numbers: 16, 21, 25, 27, and 28.

FACTOR III Student interest includes the following question numbers: 7, 10, 17, and 22.

FACTOR IV Textbooks includes the following question numbers: 4 and 8.

FACTOR V Classroom facilities includes the following question numbers: 15, 19, and 25.

FACTOR VI Examinations includes the following question numbers: 5, 9, and 13.

FACTOR VII Classroom discussions includes the following question numbers: 6, 14, 20, 22, and 29.

STUDENT QUESTIONNAIRE

This questionnaire is a measure of your perception of your professor's instructional ability. In addition, it is designed to assess your reaction to such additional factors as the adequacy of the textbook, the classroom, your interest in the subject, etc. The measure that this questionnaire is most concerned with is your perception of the instructor's teaching ability. This factor (teaching ability) is of prime importance for several reasons. First, it provides feedback to the professor regarding your perception of his teaching ability. Second, it is one source of information used for determining whether your professor obtains a promotion and/or a salary increase.

INSTRUCTIONS

Please indicate on the answer sheet the extent to which you agree or disagree with each statement or question. Note that some of the statements are phrased in a negative fashion. After reading each statement, carefully blacken in the blank on the answer sheet which best represents how you feel about the statement. The meanings are at the top of each column on the answer sheet. If you have no basis for choice, or if the statement does not apply to this class please mark the last column--No Basis for Choice; DO NOT MARK the column reading Neither Agree Nor Disagree.

Please feel free to comment after each question on the question sheet. Do not write comments on the answer sheet. Any suggestions or criticisms of the entire rating sheet will be appreciated.

1. Because of the way it was taught, I learned very little from this course.
2. The instructor was apparently very well informed about the subject matter of this course.
3. The instructor was generally not well prepared for class meetings.
4. The textbook helped to integrate factual material.
5. The examination questions were often ambiguous.
6. The instructor provided ample opportunity to discuss, disagree with, or question points raised in class.
7. I was interested in the subject matter of this course before taking it.
8. The textbook did not contribute significantly to what I learned from this course.
9. The feedback concerning examinations, homework, etc., enabled me to determine clearly my progress in the course.
10. At the present time, I am not interested in the subject matter of this course.
11 I would not recommend this teacher to a friend.
12. Information contained in catalog descriptions was not consistent with the course content.
13. The examinations and quizzes did not contain a good sample of the subject matter of this course.
14. The instructor made it clear how each topic fits into the course.
15. The size of this class was much too large for this course.
16. The instructor provided guidance in choice of topics and suggestions for appropriate research on outside assignments.
17. The lectures were related to one another and followed a coherent sequence.
18. The instructor displayed a lack of interest in the subject matter of this course.
19. The classroom facilities were well suited for this course.

20. The instructor made the subject matter more meaningful to me through the use of examples and applications.

21. The lack of supplementary materials in the library has been a serious handicap to me in this course.

22. The instructor aroused my interest in the subject matter of this course.

23. Explanations to clarify the material in this course were frequently ineffective.

24. In comparison with all other teachers I have had at Texas A & M, I would rate this instructor as below average.

25. This course has required a great deal more time and effort than other courses at the same level.

26. The instructor provided a coherent framework for the topics covered.

27. In general, the required readings (other than the principal text) were not relevant to the subject matter of the course.

28. The instructor was generally difficult to contact for consultation or discussion outside of class.

29. The instructor raised stimulating, provocative questions.

LAB QUESTIONS-Answer only if course had a lab section.

30. The lab sessions contained the right amount of structure and guidance by the instructor.

31. The laboratory instructor was usually available for individual guidance and help.

32. The laboratory equipment was more than adequate for this course.

33. The laboratory sessions did not provide an opportunity for creative and imaginative work.

34. The interest in or enthusiasm for experiments or experimental procedures in the laboratory was very low.

35. The laboratory material was integrated with the lecture material and added significantly to the course.

ADDITIONAL COMMENTS:

1. Suggestions concerning this rating sheet.

2. Suggestions concerning this course.

INDEX OF MAJOR DEPARTMENTS

Please indicate your major department directing your course of study. For example, your course of study may be Animal Nutrition, but your major department is Animal Science, or your course of study may be Botany of Microbiology, but your major department is Biology.

1 Accounting
2 Aerospace Engineering
3 Agriculture
4 Agricultural Economics
5 Agricultural Education
6 Agricultural Engineering
7 Agronomy
8 Animal Science
9 Anthropology
10 Architecture
11 Biochemistry
12 Bioengineering
13 Biology
14 Biophysics
15 Building Construction
16 Business Analysis
17 Chemical Engineering
18 Chemistry
19 Civil Engineering
20 Computing Science
21 Czech
22 Dairy Science
23 Econometrics
24 Economics
25 Educational Administration
26 Educational Curriculum & Instruction
27 Educational Psychology
28 Educational Technology
29 Electrical Engineering
30 Engineering
31 Engineering Design Graphics
32 Engineering Technology
33 English
34 Entomology
35 Environmental Design
36 Finance
37 Forest Science
38 French
39 Genetics
40 Geography
41 Geology
42 Geophysics
43 German
44 Health Education
45 History
46 Horticulture
47 Humanities
48 Industrial Education

49 Industrial Engineering
50 Interdisciplinary Education
51 Interdisciplinary Engineering
52 Journalism
53 Landscape Architecture
53 Liberal Arts
55 Linguistics
56 Management
57 Marketing
58 Mathematics
59 Mechanical Engineering
60 Mechanics and Materials
61 Meteorology
62 Modern Languages
63 Nuclear Engineering
64 Oceanography
65 Petroleum Engineering
66 Philosophy
67 Physical Education
68 Physics
69 Plant Pathology
70 Plant Physiology
71 Political Science
72 Poultry Science
73 Pre-Dental
74 Pre-Medical
75 Pre-Veterinary
76 Psychology
77 Range Science
78 Recreation and Parts
79 Russian
80 Safety Education
81 Sociology
82 Soil and Crop Sciences
83 Spanish
84 Speech
85 Statistics
86 Systems Engineering
87 Theater Arts
88 Urban and Regional Planning
89 Veterinary Anatomy
90 Veterinary Medicine & Surgery
91 Veterinary Microbiology
92 Veterinary Parasitology
93 Veterinary Pathology
94 Veterinary Physiology & Pharmacology
95 Veterinary Public Health
96 Wildlife and Fisheries Science
97 OTHER

DO NOT MARK IN THIS AREA

DEPARTMENT CODE	10	20	30	40	50	60	70	80	90	1	2	3	4	5	6	7	8	9		
COURSE CODE	100	200	300	400	500	600	700	800	900	10	20	30	40	50	60	70	80	90	1	2	3	4	5	6	7	8	9
SECTION CODE	100	200	300	400	500	600	700	800	900	10	20	30	40	50	60	70	80	90	1	2	3	4	5	6	7	8	9
TIME CLASS BEGAN	8-9		9-10		10-11		11-12		12-1		1-2		2-3		3-4		4 OR LATER			

BACKGROUND INFORMATION

FOR QUESTION 2 BELOW, MARK THE 2 BOXES WHICH ADD TOGETHER TO GIVE YOUR MAJOR DEPARTMENT CODE. FOR EACH OTHER QUESTION, MARK THE SINGLE BOX WHICH BEST DESCRIBES YOUR CHARACTERISTICS.

1. WHAT IS YOUR CLASS STANDING THIS SEMESTER?	FRESHMAN	SOPHOMORE	JUNIOR	SENIOR					
	MASTERS	DOCTORAL	OTHER						
2. WHAT IS YOUR MAJOR DEPARTMENT? (SEE INDEX ON LAST PAGE OF QUESTIONNAIRE AND ENTER HERE)	10	20	30	40	50	60	70	80	90
	1	2	3	4	5	6	7	8	9
3. WHAT WAS YOUR ACCUMULATIVE G.P.R. AT THE BEGINNING OF THE SEMESTER?	BELOW 2.00	2.00-2.49	2.50-2.99						
	3.00-3.49	3.50-ABOVE	HAVE NOT ESTABLISHED ONE						
4. WHAT GRADE DO YOU EXPECT IN THIS COURSE?	A	B	C	D	F	PASS	FAIL		
5. WHAT IS YOUR PRESENT AGE?	18 or below	19	20	21	22-23				
	24-26	27-30	31-39	40 OR OVER					
6. WHAT IS YOUR SEX?	MALE	FEMALE							
7. ON THE AVERAGE HOW MANY HOURS PER WEEK DID YOU SPEND ON THIS COURSE OUTSIDE OF CLASS?	LESS THAN 1	3-4	MORE THAN 6						
	1-2	4-5							
	2-3	5-6							
8. WHAT WAS YOUR REASON FOR ENROLLING IN THIS CLASS?	RECOMMENDED BY OTHER STUDENTS	REQUIRED BY ADVISOR							
	RECOMMENDED BUT NOT REQUIRED BY ADVISOR	PERSONAL CHOICE							

EVALUATIVE QUESTIONNAIRE

FOR EACH OF THE STATEMENTS ON THE ATTACHED SHEET MARK THE RESPONSE POSITION IN THE CORRESPONDING COLUMNS BELOW WHICH BEST DESCRIBE THE EXTENT TO WHICH YOU AGREE OR DISAGREE WITH THAT STATEMENT.

	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE NOR DISAGREE	SLIGHTLY AGREE	AGREE	STRONGLY AGREE	NO BASIS FOR CHOICE
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